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GROWING ALFALFA IN BRITISH COLUMBIA

(SOUTHERN INTERIOR)

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MAIN STEPS IN GROWING ALFALFA

Give alfalfa major consideration in your hay program. It is one of the heaviest producers of highly nutritious feed in the interior of British Columbia.

Use the variety Vernal or Beaver for irrigated land and Ladak for dry land. Use certified seed if possible.

Select the best land you have. Good drainage is especially important.

Apply 500 to 600 pounds of superphosphate (0-19-0) per acre and disk it into the soil before seeding.

Make sure the seedbed is firm and well prepared.

Seed at 10 pounds per acre. Shallow seeding is necessary for good establishment of the stand.

Cut alfalfa for hay when about one tenth of the blossoms have opened. This gives the best balance between yield, quality of hay, and longevity of stand.

Practise good management to ensure high yields of good hay and to check the spread of disease.

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Publication 1107, "Growing Alfalfa in British Columbia", applies specifically to the southern interior of the province. By error, this was not indicated in the title. Would you please stick the enclosed gummed labels on the covers of any copies you have, directly under "British Columbia"?

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GROWING ALFALFA IN BRITISH COLUMBIA

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Range Experimental Farm, Kamloops, B.C.

Alfalfa is the most important forage crop in the interior of British Columbia. It has many requirements of a high-quality forage. It produces an abundance of very palatable feed, high in mineral content and protein.

Most of the hay and pasture lands of the interior of British Columbia are irrigable and are very suitable for alfalfa production. With good cultural practices the recommended varieties yield as much as 6 tons per acre.

TYPES OF ALFALFA

Alfalfa is a herbaceous, perennial legume belonging to the pea family. As a rule, the plant has a distinct taproot that penetrates the soil to a considerable depth. The stems are slender and erect and are commonly about 2½ feet high. They arise from a semiwoody base known as the crown.

Nodules on the roots contain nitrifying bacteria, which can take in nitrogen from the air and store it on the roots.

Only three of the many species of alfalfa are important in farming.

1. *Common alfalfa*[1] may be a long-lived perennial under favorable conditions. It has a typical taproot. Its numerous leafy branches emerge from the crown and are practically upright. Its flowers are borne in loose bunches and are usually purplish. The pods that bear the seeds are in twisted spirals of one or more turns. This species includes the three commercial groups of alfalfa known as common, Turkistan, and nonhardy.

2. *Yellow alfalfa*[2] is a variable species differing in a number of characteristics from common alfalfa. The flowers are small and range in color from light to deep yellow. The seed pods are straight to slightly curved or twisted. The crown is set slightly below the ground surface and the branches grow semiprostrate. The root is not strictly a taproot but rather has many branches, so that the plant appears to be creeping-rooted. This species does not recover readily after the first cutting. Perhaps its greatest value has been its contribution to hardiness in a plant-breeding program.

3. *Variegated alfalfa*[3] is a hybrid between common and yellow-flowered alfalfas. The plants have many different combinations of the characteristics of the two parent species. Most of them grow upright and produce flowers of variegated colors. The usual color is similar to that of ordinary alfalfa although brown, green, greenish yellow and white are not uncommon. As a rule the alfalfas of this group are more resistant to cold than the common alfalfas, probably because of the presence of the yellow-flowered alfalfa in their ancestry.

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[1] *Medicage sativa.*
[2] *Medicago falcata.*
[3] *Medicago media.*

VARIETIES COMMON IN BRITISH COLUMBIA

Grimm

This was the first variegated alfalfa introduced into North America. Several strains of Grimm have been developed at the University of Saskatchewan, some with outstanding winter-hardiness and some with high seed-producing characteristics. It is winter-hardy but because it is susceptible to bacterial wilt it is now grown less than it used to be in irrigated areas, where this disease is destructive.

Ladak

Ladak was introduced into the United States in 1910 from northern India, and into Canada in 1925 at the University of Saskatchewan. Where it is adapted it is outstanding for its ability to make an exceptionally heavy first crop. This is especially valuable in northern areas where only one crop of hay is normally obtained. It is winter-hardy and has some resistance to bacterial wilt. It is also exceptional in that it goes dormant during the long periods of summer drought and revives well when moisture conditions become favorable. Perhaps its major disadvantage is its slow recovery after the first cut.

Ranger

Ranger was developed at the Nebraska Agricultural Experiment Station. It was bred from selections made of Cossack, Turkistan, and Ladak. It is highly resistant to bacterial wilt and is also relatively cold-tolerant.

Vernal

This variety was developed at the University of Wisconsin. It is highly resistant to bacterial wilt and is winter-hardy. It is fine-stemmed, and noteworthy for its dark-green color. Vernal can withstand cutting practices that quickly thin out varieties like Grimm and Ladak.

Du Puits

This, as its name indicates, is a variety introduced from France. It grows erect and has rather coarse stems. It is an extremely high forage yielder where adaptable, grows rapidly after cutting and matures earlier than most of our common varieties. However, it is not winter-hardy or resistant to bacterial wilt.

Rhizoma

Rhizoma is a creeping-rooted variety developed at the University of British Columbia. It is being used to some extent in the interior. It is cold-tolerant but susceptible to bacterial wilt. It does well where it is adapted and yields well.

Rambler

Rambler is a creeping-rooted variety developed at the Experimental Farm, Swift Current, Saskatchewan. It is very winter-hardy and drought-resistant. It recovers slowly on irrigated land and is only moderately resistant to bacterial wilt.

Beaver

Beaver, a new variety highly resistant to bacterial wilt, was developed jointly by the research stations at Saskatoon, Sask., and Lethbridge, Alta. It is winter-hardy and is adapted to the same general conditions as Vernal.

CULTURE

Selecting the Soil

Select the most productive soil on your farm for alfalfa. Do not attempt to grow the crop on land that is nonproductive with the idea of building it up as is often done. Give careful consideration also to soil texture, fertility, and drainage. Where possible, avoid very sandy or compact soil.

Good drainage is important in establishing stands. Complete submergence for 1 to 2 days during the growing season or the formation of ice sheets during the winter may destroy the stand. Alfalfa seldom grows well when the water table comes close to the surface, especially if the level of the table fluctuates.

Preparing the Land

For the seedbed have the soil compact, finely pulverized and mellow to the depth of sowing. To do this, it is best to begin preparing the seedbed early. If the alfalfa is to follow a grain crop, plow as soon after harvest as possible. Shallow plowing is better than deep plowing for making the seedbed firm. Work the soil to kill weeds and volunteer grain as well as to settle the seedbed. Methods used for preparing the seedbed vary in different areas because of weather and soil conditions.

Fertilizers

Though alfalfa is an excellent soil-builder, it needs a great deal of nitrogen, phosphorus, potassium, and calcium. As alfalfa returns a large amount of nitrogen to the soil, it is not necessary to add this element. The numbers of pounds of plant food removed annually per acre by alfalfa hay in comparison with oats[4] are as follows:

Crop	Yield	Nitrogen	Phosphoric acid	Potash	Calcium
Alfalfa	6000	140-150	20-40	120-130	70-85
Oats					
grain	1700	40-50	16-20	35-40	7-9
straw	2500				

It has been shown at the Kamloops experimental farm that 500 to 600 pounds of superphosphate (0-19-0 or 0-20-0) should be worked into the soil during preparation of the seedbed for alfalfa, and a lighter top-dressing applied every 3 or 4 years.

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[4] Figures compiled from several sources, including:
Canada Department of Agriculture. Alfalfa for hay, silage and pasture. Publication 735 (Farmers' Bull. 110). 1948.
Hughes, H.D., and E.R. Henson. Crop production. Macmillan Publishing Co., New York. 1938.

Though 11-48-0 is usually beneficial when applied at 200 pounds per acre in the spring, it is not generally recommended. That no benefit is obtained sometimes from applying this mixture is probably due to its having no available sulphur. In areas where sulphur deficiency has been diagnosed, gypsum is beneficial. Normally, users of superphosphate have no need to apply gypsum since this fertilizer contains a considerable amount of sulphate of lime as a product of its manufacture.

Barnyard manure is beneficial to alfalfa. If possible, apply it on the preceding crop. This allows the manure to decompose and also gives time for weed seeds spread with the manure to germinate and be destroyed. You may also add it as a top-dressing on established stands, applying it in the late fall or winter to prevent interference with haying.

Seeding

The time for seeding alfalfa depends upon soil moisture and weather conditions. If the land is irrigated it is advisable to seed in the spring; in a severe winter, fall-planted seedlings may be winterkilled badly.

Make spring plantings as soon as possible after the land is fit to work. The earlier the planting is made the easier it is to maintain favorable moisture conditions until the seedlings are well established.

Since there are about 220,000 alfalfa seeds in the pound, sowing at 1 pound per acre would give five plants per square foot if all the seeds germinated and grew. However, it is necessary to sow 5 to 10 pounds of seed per acre (Table 1). The lower rates are usually needed for low moisture and the high rates for high moisture conditions. If the seedbed is well prepared there is no justification for sowing more than 10 pounds of seed per acre.

Table 1.– Tons of hay per acre harvested on irrigated land from Grimm alfalfa seeded at various rates, Kamloops experimental farm, 1953-57

Seeding rate Pounds per acre	1953	1954	1955	1956	1957	5-year average
5	7.91	7.91	7.67	6.16	3.02	6.53
10	8.14	8.26	7.91	7.91	3.26	7.09
15	8.37	8.27	8.14	6.98	3.37	7.02
20	7.91	8.26	7.91	6.86	3.37	6.86

For seeding, use a grain drill with a grass seeder attachment, or use an alfalfa drill. Or broadcast the seed with a hand seeder and cover it with a light harrow or a brush drag. The depth of seeding depends on the character and condition of the soil. On heavy soils half an inch is usually deep enough, but on

light soils it may be necessary to sow the seed 1.5 inches deep to ensure contact with the soil moisture. Packing the soil before and after sowing favors germination.

Recommended Varieties

On the basis of variety trials at the Kamloops experimental farm, Vernal or Beaver is recommended for irrigated land and Ladak for dry land.

Before sowing any alfalfa seed, learn the characteristics of the varieties recommended for your particular area or region. On the drier areas, where only one cut is possible, Ladak should be sown. However, on irrigated areas, where more than one crop is harvested during the season and bacterial wilt is a problem, Vernal is recommended (Table 2).

Table 2.– Tons of hay per acre harvested on irrigated land from various varieties of alfalfa, Kamloops experimental farm, 1953-57

Variety	1953	1954	1955	1956	1957	5-year average
Grimm	7.94	8.05	8.00	6.63	4.53	7.02
Ladak	8.39	7.96	7.66	6.98	6.63	7.52
Rhizoma	8.12	8.06	8.20	6.98	5.93	7.46
Ranger	7.79	8.24	8.19	7.94	8.39	8.11

Inoculation

Immediately before seeding, inoculate the seed. Inoculation provides enough nitrifying bacteria in the soil to enable the alfalfa plant, through nodules on the roots, to make use of the free nitrogen in the air. Preferably inoculate the seed even if the land has grown alfalfa before, as the bacteria may have been killed or lost their strength.

Use one of the cultures supplied by commercial firms. Directions for using it are always included on the container.

Nurse Crop

Nurse crops are desirable on irrigated land. They not only control weeds but also give some return from the land while the alfalfa is becoming established.

The chief objection to nurse crops is that they draw heavily on the moisture supply of the soil. However, the nurse crop is probably no harder on the alfalfa than the many weeds that usually grow in early seedings without a nurse crop.

In tests at the Kamloops experimental farm, oats seeded with alfalfa at 60 pounds per acre produced over a ton of additional feed.

In dry farming regions, where moisture is limited, the alfalfa usually fails to become established if a nurse crop is sown.

Mixtures for Hay

In irrigated areas, mixtures produce little or no more than alfalfa grown alone. In some areas brome grass has been sown with alfalfa, but in tests at the Kamloops experimental farm it was not competitive enough with the possible exception of Manchar brome. Some ranchers like to grow brome, timothy or orchard grass with alfalfa as an aid in curing hay.

Water Requirements for Alfalfa

Alfalfa requires more water than most crops. It is estimated that 750 tons of water are used in the production of one ton of cured alfalfa hay. On irrigated land two or three crops are usually taken each year in the southern interior of British Columbia. Under favorable conditions a crop matures for hay in about 30 or 35 days.

On irrigated land apply water often enough for the plants to grow at a maximum rate. The yields of alfalfa and the life of the stand might be increased considerably if more care were used in finding out when to apply water. Avoid applying too much or too little water and deluging the soil with cold water when it needs only heat. Too much water depletes soil nitrogen rapidly, raises the general level of the water table, and contributes to drainage and alkali problems.

HARVESTING

Hay

Cutting alfalfa continuously at an immature stage such as the prebud or bud stage not only reduces the total yield but also kills the stand prematurely. The plants die primarily because of the continuous reduction of food reserves in the roots by the early cutting. Alfalfa with low root reserves is especially susceptible to winterkilling. However, alfalfa cut at an immature stage has a higher protein content and higher feeding value than when cut later. Thus it becomes a question of a balance between early and late cutting. The main considerations are production, quality of hay, and longevity of stand.

Experiments show that the balance is found best by cutting when about one tenth of the alfalfa blossoms have opened. You may take one cutting a year before this stage without unduly injuring the stand or yield. However, do not cut at the premature stage late in the year because this would lower the food reserves. Take the last cutting in the fall at least four weeks before the average date of the first killing frost. This permits considerable top growth and abundant food storage in the roots before freeze-up.

At early bloom, slightly more than half of the alfalfa plant consists of leaves, which contain most of the protein and vitamins. It is therefore essential to retain the leaves to make high-quality hay. To retain them, practice the following: cut the alfalfa in early bloom, handle it as little as possible, cure it partly on the spot before raking, and bale it as soon as it is dry. Hay to be baled should not contain more than 17 to 23 per cent moisture.

Pasturing

For pasture the risk of bloat limits the use of alfalfa, even in mixtures. However, it has done very well at the Kamloops experimental farm when sown in alternate rows with crested wheat grass. This mixture has provided early-spring pasture, two crops of hay and a late-fall pasture. From the standpoint of seasonal distribution and total seasonal yield, alfalfa makes a good pasture crop.

If you do pasture alfalfa, do not do so until after the first year and never pasture it closely, as grazing to the crowns often kills the plants. Practice rotational grazing to maintain stands and for high production. Never allow cattle on a field when the ground is wet. At the Kamloops experimental farm, sheep have been pastured on pure alfalfa without any serious ill-effects.

Alfalfa may be added to a mixture of brome and orchard grass with excellent results. The rate of seeding used has been brome, 12 pounds per acre; orchard grass, 8; and alfalfa, 4. Note that careful management is essential if the alfalfa is to be maintained in the stand.

Growing Seed

Very little alfalfa is grown for seed in the interior of British Columbia. However, there are many localities where the climate, soil and water supply are suitable for high yields of excellent quality seed.

Preferably grow certified or registered seed of a recommended variety. In this way you can almost always be assured of a ready market. Only registered and certified seed may be sold as named varieties.

Select a good clean soil and plant in rows. This makes cultivation, spraying, and rogueing easy.

Early-spring seeding is the best as it gives the plants a chance to become established before the hot weather arrives. As a rule, sow 5 or 6 pounds per acre. If you seed in the fall, sow it between August 15 and September 15. Inoculate all seed with right culture of nitrogen-fixing bacteria.

Hot, dry weather favors seed setting, so that under irrigation the second crop is saved for seed production. But under dryland conditions the first crop is saved for seed. The quality of seed harvested depends on the weather during the harvest period. As all the seed pods never ripen at the same time, harvest the alfalfa when two thirds to three quarters of the pods are brown. If the weather is dry during the ripening period little shattering occurs. However, intermittent rain may cause considerable loss of seed.

The usual method of harvesting is to use a windrow attachment on a mower, allow the hay to cure in the windrow and thresh it with a pick-up combine. Some cock the hay, allow it to cure and, when time permits, haul it to the thresher.

Silage

Alfalfa ensilage makes an excellent quality feed. It provides an acceptable means of using weedy first cuttings and cuttings made during weather that is not favorable for curing hay. The ensilage retains more protein and considerably more carotene than does field-cured alfalfa. Eighty-five per cent of the food value of the green plant is preserved in good silage.

For best ensilage cut the alfalfa when a tenth of the blossoms have opened. Let it wilt to about 60 to 68 per cent moisture before putting it into the silo. Add 60 to 80 pounds of molasses to each green ton to improve the quality and provide sufficient sugar to ensure proper fermentation to preserve the silage.

Silage from alfalfa alone or alfalfa with grass is usually strong unless you use an additive high in carbohydrate. Chop or cut the silage finely and pack it well in the silo.

Green Feed

For use as green feed the alfalfa is cut, chopped, and blown directly into trucks or trailers. These are driven through the corral area and unloaded either mechanically or by hand directly into the feed bunks. The stage of growth for cutting is the same as for cured hay. In early spring or late fall, when blossoms are scarce, cutting should be done at about the time new shoots start growth.

There are several advantages in feeding green-chopped alfalfa. Practically no protein or carotene is lost. Feed of a uniform quality is available for the animals from day to day with almost no waste. Bloat occurs less often when alfalfa is fed green than when it is pastured.

However, this type of feeding requires a rather large investment in machinery and skilled labor. Maintenance of the machinery is expensive and failure of equipment may disrupt the feeding schedule. Irrigation schedules must be planned so that the ground is dry enough before the machinery is taken into the field; otherwise the soil may be damaged by heavy traffic.

DISEASES[5]

Diseases, especially those that attack the roots and crowns, may seriously affect establishment and maintenance of alfalfa stands.

Crown Bud Rot

This is a widespread and important disease of alfalfa and is at present the main limiting factor in the longevity of irrigated alfalfa in the interior of British Columbia. It is caused by at least four species of soil-borne fungi. It first appears in second-year alfalfa and becomes progressively more destructive as the alfalfa stand grows older.

Symptoms of crown bud rot are brown spotting and eventual death of crown buds and young shoots near the soil surface; the rot later extends into the crowns themselves. Severely diseased plants produce very little top growth so that the field is weedy.

This disease can be curtailed by good management of recommended alfalfa varieties. See that alfalfa plants enter the winter in a healthy condition. Late pasturing and late cutting of the third crop of hay increase the injury during the winter and drastically reduce the productivity of the stand the following year.

[5]Prepared by E.J. Hawn, plant pathologist, Research Station, Lethbridge, Alta.

Bacterial Wilt

Bacterial wilt is one of the main diseases of irrigated alfalfa. It is distinguished by a gradual stunting and yellowing of the plants in the second or third year of growth. This is usually the first sign of the disease. The tips of the shoots on whole plants sometimes wilt during warm weather, and the severely infected plants die. The wilt can also be identified by examining the roots of suspected plants. If you pull back the bark of the main tap root of a diseased plant, you will see that the woody layer immediately under the bark is yellowish brown.

To control this disease it is best to grow resistant varieties that are cold-hardy. Susceptible varieties, like Grimm and Du Puits, remain productive for only two to four years, whereas Vernal and Ranger produce well for at least five to six years (Figure 1). Avoid cultivating diseased stands and other practices that wound the alfalfa roots and provide avenues of entry for the bacteria. If a field has been severely damaged by the wilt, do not reseed it to alfalfa for at least two years.

Resistance to bacterial wilt: Left, a five-year stand of a resistant variety, Ranger, on irrigated land. Right, weeds where Du Puits, a susceptible variety, was sown at the same time.

Black Stem

Black stem, caused by a fungus, may reduce stands by blighting the seedlings, rotting the crown buds, and killing the stems and leaves. The disease appears in early summer, when small, irregular dark-brown spots develop on the

lower leaves, crown buds, and bases of young stems. Severely infected leaves fall to the ground during haying or before and are lost. Cut affected crops before the leaves drop.

Witches'-broom

Witches'-broom of alfalfa is caused by a virus that is carried by leafhoppers. Infected plants have many fine, erect, pale-green shoots, or broom-like growth. Cultural practices that maintain thick, vigorous stands of alfalfa help to control the disease. Thin, unthrifty stands are attractive to the leafhoppers.

Winter Crown Rot

Winter crown rot, or snow mold, may be recognized in the spring by irregular patches of dead plants in alfalfa fields. White remnants of the fungus are sometimes found on the crowns of dead or damaged plants when the snow melts. Most of the common varieties of alfalfa are very susceptible to this disease.

Crop rotation is probably the most valuable method of controlling this rot. Grow annual crops or resistant grasses for two or three years to remove most of the fungus from the soil. In heavily infested land you may safely grow spring-sown cereals, brome, or crested wheat grass.

CONTROL OF WEEDS

Weeds may become troublesome in the growing of alfalfa. The most common ones are blue grass, quack grass, cheat grass, chickweed, barnyard grass, knotweed, pigweed, and lamb's-quarters. Some fields are infested with perennials like Canada thistle, plantain, and dandelions. In areas where bacterial wilt is common, weeds become increasingly abundant as they replace the killed-out alfalfa.

The most satisfactory means of control is to follow the recommended cultural practices for the area. These include thorough preparation of the seedbed, use of high-quality seed of recommended varieties, and sound methods of removing hay.

Another of these cultural practices is to grow a nurse crop if moisture is adequate. At the Kamloops experimental farm few or no weeds grow in the first year when 60 pounds of oats are seeded with the alfalfa and the oats are taken off as green feed. The oats yield an extra ton per acre of quality feed. The only danger in this method is that when the oats are taken off in extremely hot weather the change from shade to full sunlight may shock the alfalfa.

If you do not sow a nurse crop, mow two or three times the first year, cutting high enough not to injure the alfalfa.

In established stands, cultivation may help to check the weeds but it must be done with considerable care so that the alfalfa is not injured.

Herbicides are another useful means of controlling weeds. The following recommendations are given by the National Weed Committee for 1961[6]. The rates are given in terms of acid equivalent or active ingredient. To be sure of the correct amount, always follow the directions on the label.

[6] 1961 weed control recommendations for Western Canada, National Weed Committee, Western Section, Canada Department of Agriculture, Ottawa.

Treat seedling stands – with or without a companion crop – early (when the first trifoliate leaf appears) to kill susceptible weeds with one of the following:

1. 4-(2,4-DB) at 16 to 20 ounces per acre in 20 gallons of water;
2. MCPA amine at 4 to 6 ounces per acre;
3. 2,4-D amine at 3 to 4 ounces per acre;
4. MCPA sodium salt at 3 to 6 ounces per acre;
5. DNBP amine at 1¼ to 1½ pounds per acre in 80 gallons of water at a pressure of 35 psi. Do not apply this chemical in cold weather or when there is risk of rain within 24 hours.

In established stands, for early annual weeds such as Russian pigweed use 2,4-D or MCPA ester at 8 to 16 ounces per acre. Apply the chemical before growth starts in the spring. For an application when the alfalfa is one to three inches high use the lower rate. Do not apply the chemical after the alfalfa is four inches tall.

CONTROL OF INSECTS

Cautions

When applying a chemical against insects, take every precaution to avoid residue on pasture or other forage that would render milk, meat, or other animal products unfit for sale. Follow closely all the cautions on the insecticide label.

Grasshoppers

Grasshoppers may damage alfalfa seriously. They are, however, less of a problem on irrigated crops than on rangeland. The number necessary to cause important damage varies with the stage of the crop.

A number of changes in control recommendations are now being considered by entomologists, so before you undertake control measures consult your district agriculturist or nearest experimental farm.

In general, sprays kill more grasshoppers at application time than dusts do, continue to kill for a longer period, and require less insecticide per acre. Baits are not satisfactory in good stands of succulent alfalfa, but are sometimes effective after harvest.

In seed crops where forage will not be fed to stock, dieldrin, aldrin, and heptachlor are each satisfactory.

Lygus Bugs

For high yields of alfalfa seed, lygus bugs must be controlled. These bugs feed on the buds, flowers, and seeds of the alfalfa and cause serious losses in yield of seed.

To control these insects, apply DDT, as a spray or a dust, at ¾ pound per acre. Apply it about June when the alfalfa is in bud but before any flowers appear.

Sometimes alfalfa grown for seed may be re-infested during the bloom period so that a second application of insecticide is needed. Then apply DDT at the above rate, or 20 pounds of 10 per cent toxaphene dust per acre. Apply it before 7:00 a.m. or after 7:00 p.m., when few if any bees are working the flowers.

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